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THE PEAR AND HOW TO GROW IT.

BY

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., November 25, 1911.

SIR: I have the honor to transmit and to recommend for publication as a Farmers' Bulletin the accompanying manuscript, entitled "The Pear and How to Grow It," prepared by Col. G. B. Brackett, Pomologist.

This paper is designed to give practical directions for the guidance of the amateur, as well as for the farm orchardist. The information contained is based largely upon the experience of the writer of this paper.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

[A list giving the titles of all Farmers' Bulletins available for distribution will be sent free upon application to a Member of Congress or the Secretary of Agriculture.]

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THE PEAR AND HOW TO GROW IT.

INTRODUCTION.

The pear has long been regarded as one of the most luscious of the many kinds of fruit brought under cultivation. The choice varieties excel most apples in rich, juicy texture and delicacy of flavor, and for both dessert and culinary purposes, either canned or in the fresh state, the pear is considered a great acquisition. With a proper selection of varieties and with careful handling and storing of the fruit its season of use may be extended from midsummer to late winter without resorting to artificial means of preservation.

Pear trees are more difficult to maintain in a healthy, productive condition than apple trees and can not be grown with the same degree of success over so wide an area of country. Such has been the uncertainty of success in growing pears in many parts of the United States that few farmers have the needed confidence to plant even the few trees necessary to provide fruit for home use. This lack of confidence too often leads to neglect, which in many instances becomes the prime cause of ultimate failure.

The information in this bulletin is based on practical experience and should bring success to the planter in any locality where the pear flourishes. By following these details the farmer will be enabled to grow enough choice fruit to supply his own family; and if he should wish to extend his planting for market purposes he will find a ready sale for his surplus crop. With these objects in view care should be given to the selection of varieties.

Two distinct classes or types of the pear are now grown in this country: (1) The European and (2) the Asiatic, or oriental.

The European type is a native of Europe; from it most of our domestic varieties have sprung. Pears of this class are well adapted to the New England States, New York, and other States southward and westward to California, Washington, Oregon, and Idaho. In the States named beyond the Rocky Mountains extensive commercial orchards have been planted with choice varieties of this class of pears, the Bartlett leading all other varieties in commercial plantings.

The Asiatic, or oriental, type is of comparatively recent introduction. In its natural condition it is scarcely an edible fruit and must

receive an admixture of our improved European varieties in order to render it at all acceptable. The more important varieties grown in America are hybrids, the results of artificial or accidental crossing with our domestic pears of European origin. To this class belong Le Conte, Kieffer, Garber, Smith, and other hybrids. While these are not considered as valuable for dessert use in the fresh state as varieties of the European type, they are much esteemed for canning and culinary purposes. These hybrids are very productive and well adapted to a wide range of country extending from New Jersey, Delaware, Maryland, and Virginia southward to Florida and Texas. In some of these States the industry has grown to large proportions. The Kieffer and Le Conte are the varieties of the oriental type that have gained the greatest commercial prominence.



FIG. 1.—Dwarf pear orchard of Albert Wood, Carlton Station, N. Y.

DWARF AND STANDARD TREES.

DWARFS.

Trees propagated by budding the pear upon quince stock are known as dwarfs. The Angers variety of quince is principally used for this purpose. Such trees develop a fibrous root system, are dwarfed in habit and generally productive, and come into bearing early. Some varieties succeed better on quince stock than on pear stock.

The dwarf type of tree may be advantageously used on small city lots, but in some of the Eastern States there are many large and profitable commercial pear orchards of small size which yield fine crops of fruit. (Fig. 1.) Pears of European origin are not adapted to the Southern States except in the more elevated localities.

STANDARDS.

Trees produced by grafting or budding improved varieties on seedling pear stock are known as standards. They are comparatively longer lived than dwarfs and in time becomes larger trees, capable of yielding heavier crops of fruit, but they usually come into bearing more tardily than dwarf trees.

CONVERTING DWARF TREES INTO HALF STANDARDS.

A method often practiced with good results is known as the "lip-ping process." It consists in making a slit with a sharp knife through the bark and slightly into the sapwood of the tree in an upward direction just above the union with the quince root on which it has been worked. At these lips a callus forms from which roots grow and these in time become strong enough to sustain the tree after the quince roots become inactive. The treatment must be given at the time of setting the trees, and they must be planted deeper than usual so that the point of union will be several inches under ground.

The gain by this process is that the dwarf tree, which comes into bearing early, eventually becomes a standard capable of bearing larger crops and being of greater longevity.

PROPAGATION.

It is hardly worth the farmer's time and trouble to propagate his own trees for planting, but he should have some definite idea of the processes and methods of propagation customarily practiced. The pear, like all other fruits, is subject to adaptation to environment. Pears do not certainly reproduce themselves true to variety when grown from seed; hence the necessity for budding or grafting in order to obtain the variety desired.

SEEDS.

The natural method of reproduction is by planting the seeds of the fruit, but the great majority of seedlings will produce fruit of a quality so inferior to the parent as to be practically worthless; results by this method are therefore too uncertain and disappointing for general adoption. But if seedlings are desired, good pear seeds germinate readily when saved from healthy, well-matured fruit.

The seeds should be stratified, i. e., mixed in alternate layers of moist sand in a box, covered securely to guard against rats and mice, and the box should be placed on the north side of some building where it will be exposed to freezing and thawing throughout the winter until the time for planting. If the seeds are planted in rows 3 feet apart in good soil and given thorough culture they will make a sufficient growth in one season for budding or grafting. If wanted

for root grafting the seedlings should be taken up in the fall and stored in a cellar, where they will keep fresh and be accessible at any time during the winter; if wanted for budding they may be buried in the soil outside until the time of planting in the spring, when they

may be set in nursery rows 4 feet apart with the plants 10 inches apart in the row.

The object sought by either budding or grafting is to convert an undesirable or uncertain seedling into a tree which will produce fruit known to possess desirable characteristics.

BUDDING.

The operation of budding, which must be performed during the growing season, consists in removing a bud from a twig of the desired variety and inserting it beneath the bark of the stock or young seedling which is to be changed. The inserted bud is held in place by wrapping it fast with soft cotton twine, bark, or raffia. In about 10 days the bud will have united with the stock and the wrapping may be removed. Then by cutting

back the stock or limb to near the inserted bud, the sap is forced into the newly transplanted bud and the growth of a new tree of the desired variety is promoted.

A budding knife and the successive stages of budding are shown in figure 2.

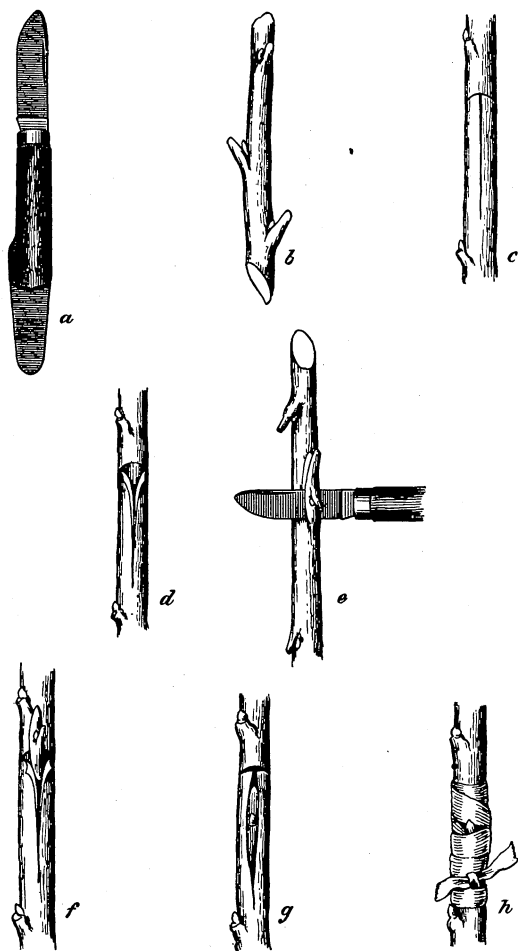


FIG. 2.—Budding: *a*, Budding knife; *b*, bud stick; *c*, lengthwise incision with cross cut at top; *d*, opening of bark for insertion of bud; *e*, removing the bud; *f*, inserting the bud; *g*, bud inserted; *h*, bud properly wrapped.

The main requisites for success in budding are (1) a healthy growing condition of the stock on which the work is to be done and (2) a certain state of maturity of the buds. The bark of the stock must separate freely, so that the bud may be forced under it without injury to the cambium layer of either bud or stock. The bud sticks or scions for budding should be of the current year's growth and should have well-developed buds. When the scions are taken from the tree the leaves must be cut off immediately, leaving only a short stub of the leaf stem for convenience in handling during the operation of budding. The bud sticks should be kept in fresh condition by means of damp moss or a wet cloth, and not more than one or two scions should be withdrawn from the package at a time.

Although budding may be done as early as well-developed buds can be obtained, the common practice of nurserymen is to insert the buds as late in the season as the bark of the stock will separate freely. By this method of late budding the bud is allowed to remain dormant through the following winter. In the spring the wrapping is removed and where the bud appears to be sound the top is cut back as already indicated. All buds on the stock below the one inserted should be rubbed off as they start to grow so as to throw all the sap into the growth of the bud inserted.

GRAFTING.

The process of grafting the pear is the same as that of the apple. The different methods of grafting have been fully described in "The Apple and How to Grow It," Farmers' Bulletin 113, of the United States Department of Agriculture, to which the reader is referred.

DOUBLE-WORKING TREES.

In propagating dwarf pear trees, the Angers quince is used as a stock on which to bud the pear, but there are some varieties of pear that do not unite well with the quince; with such varieties the method known as "double working" is used. This process consists in budding the quince stock with a variety of pear that is known to unite well with the quince; then when this has grown to a sufficient size it is top-worked to the desired variety.

LOCATION OF THE ORCHARD.

In locating a pear orchard, special reference should be given to soil, exposure, air, and water drainage. Elevated ground sloping to the east, northeast, or north is regarded as preferable. With such an exposure the sap is more backward in starting in the spring; the trees bloom later, and consequently are less liable to injury from late spring frosts. Trees planted on ground sloping to the south,

southwest, or west and exposed to the direct rays of the sun are liable to sun scald, which in some sections results in serious damage or even death to the trees.

SOIL.

The pear succeeds on a variety of soils. In a general way it may be said that the pear may be grown with a considerable degree of success in almost any soil in which the apple thrives.

For standards a clay loam having a deep, porous subsoil, such as may be found in forest clearings, into which the roots will naturally penetrate, is most desirable. In such locations decaying leaves and forest herbage have added much necessary humus to the soil, rendering it more moist and friable.

A clay loam such as has been described may be brought to the desired state of tilth by a good system of mulching and green manuring, and trees planted in it find the available plant food so necessary to maintain a healthful growth. Trees grown in such a soil are more disease resistant, and the conditions are favorable for enduring drought and the extremes of heat and cold. Under proper soil conditions pear trees attain greater longevity, maintain a greater fruitfulness, and the product is of high quality.

Dwarfs worked on the quince naturally develop a fibrous root system which thrives best in rich, humus, moist soil having a subsoil of porous clay.

DRAINAGE.

It is essential to the health of the pear that no surplus or stagnant water be allowed to remain on the surface or in the soil.

If the natural formation of the land does not afford good drainage it should be provided artificially either by underground drains or by surface ditches. The subdrainage method is preferable because it is more thorough and, if accomplished by well-laid tile, is far more satisfactory.

Breaking up stiff clay land by double-plow subsoiling will in a measure afford temporary subdrainage, but in time the soil will again become compacted and the subsoiling will need to be repeated.

FERTILIZERS.

The use of fertilizers in pear culture requires most careful consideration and judgment. Lands naturally fertile, viz, loamy soils so common in prairie regions, cleared forest lands, and clayey soils having marl in their composition, should not be enriched. Tillable lands that will grow a good crop of corn are sufficiently fertile for the pear tree. When the pear orchard begins to lose its vigor from continuous fruit crops a light surface dressing of wood ashes or

well-rotted stable manure may prove beneficial. As long as the trees maintain a normal healthy growth they require no stimulating food.

Trees that are highly stimulated and are making a rapid growth are much more liable to be attacked by blight, which is the greatest drawback to successful pear culture.

GREEN MANURES.

If humus is lacking in the soil and barnyard manure is not available, cover crops such as clover, cowpeas, vetch, etc., may be sown in midsummer after cultivation has ceased and the crop allowed to remain on the ground over winter and turned under in the spring. If this process is continued from year to year it will add greatly to the fertility of the soil as well as maintain it in suitable physical condition.

COMMERCIAL FERTILIZERS.

There are many kinds of manufactured fertilizers, some of which are valuable only for special soils or special crops. To determine what fertilizer is best to use, a knowledge of what elements are lacking in the soil is necessary. The three elements most commonly needed in soils for fruit growing are nitrogen, potash, and phosphoric acid. Chemical fertilizers which contain these substances in available form will be the most valuable.

A fertilizer containing $1\frac{1}{2}$ to 2 per cent of nitrogen, 7 to 9 per cent of available phosphoric acid, and 10 to 12 per cent of potash will give good results on land that is deficient in these elements when applied in a quantity ranging from 400 to 600 pounds per acre.

PLANTING THE ORCHARD.

SEASON FOR PLANTING.

For sections south of about the forty-first parallel of latitude the fall is undoubtedly the best season for planting, but for most of the territory north of this line it is safer to plant in the spring. If planted in the fall in the North the roots of the tree do not throw out their feeders sufficiently to supply the moisture necessary to maintain the healthy flow of sap which is essential to prevent the shriveling of branches by the exhaustive winds during winter's extreme cold.

PREPARATION OF THE GROUND.

It is as important with the pear as with any other kind of fruit tree that the land, whether for standards or dwarfs, be well and thoroughly prepared by plowing and stirring the soil and subsoil deeply before planting.

The preparation can best be done in the fall, as the effect of freezing and thawing the ground through the winter improves the soil by pulverizing it.

An excellent plan is to plow the ground in lands in the direction that will afford the best drainage, backfurfrowing with a heavy plow and leaving the dead furrows where the rows of trees are to be set. It is well to break up the bottom of this dead furrow by running a subsoil plow through it two or three times, giving it a good stirring. This method affords a deeper tilth under the trees and allows a partial underdrainage in heavy clay subsoil, if the rows are laid out with reference to this object, and is preferable to digging holes which would form basins that would hold water during rainy seasons, to the injury of the trees.

SETTING THE TREES.

After the land has been prepared as described it will only be necessary to open a furrow with a plow for the rows and to cross check to indicate the points to set the trees. The cross checking may be done with a 1-horse plow after having set stakes at the proper distance on opposite sides of the field as a guide for laying it off. Another method which will give more accurate alignment is to set a row of stakes through the center of the block each way, corresponding with stakes on the outside line. If these rows of stakes are properly aligned there will be no difficulty in planting the trees in straight rows each way. For convenience in large plantings the land should be laid out in blocks of 10 to 20 acres.

Preliminary to setting, the trees should be hauled to the land, distributed at convenient distances, and heeled in at the end of the rows in the dead furrow. After places have been properly prepared at the intersection of the furrows by simply leveling off the bottom of the furrow sufficiently to allow the roots of the tree to be put in a natural position, the trees may be set. Four persons are necessary to do the work of setting economically, viz, one to prune and distribute the trees along the rows, one to hold the tree in place, and two to shovel in the soil around the tree. The one that holds the tree first sights accurately its alignment with the center stake and the end stake beyond, while one shoveler makes the alignment of the cross row by sighting on the center stake and end stake of that row. Before setting the tree all broken and bruised roots should be cut back to sound tissue, and other roots shortened to within 4 or 5 inches of the trunk; all limbs of 1-year-olds should be removed from the top, leaving a smooth stalk, or whip, as it is called. The tree is now set in place with its roots in natural position, and fine dirt is shoveled in and trampled firmly with the foot. The tree should be set 2 to 4

inches deeper than when in the nursery, leaning it slightly to the south or southwest, to brace it against the prevailing winds and so that the top will protect the trunk of the tree from the intense heat of the afternoon sun, which is liable to cause sun scald. After the young tree is in place the top, if trimmed to a whip, may be cut back to within 12 to 15 inches of the ground. The open furrows between the trees may be filled up by using a 1-horse plow, turning two or more furrows toward the row.

DISTANCE FOR PLANTING STANDARDS.

A good distance for planting standard pear trees is 15 by 30 feet; that is, the rows are 30 feet apart and the trees 15 feet apart in the rows. The object of this method is to obtain larger crops of fruit from the same ground until the trees become large enough to interfere with each other; then each alternate tree in the row is cut out, leaving the trees in the entire orchard at a distance of 30 feet each way. This system has the advantage of more fully utilizing the land for fruit production until the thinning out becomes necessary. Another plan is to plant the trees 20 feet apart each way. This distance will afford free circulation of air and abundance of sunlight, both of which are essential to well-developed and highly colored fruit.

DISTANCE FOR PLANTING DWARFS.

Dwarfs are sometimes planted 10 feet apart each way, but 15 feet each way, or 193 trees to the acre, is better. This distance gives room to drive through the grounds for spraying and to gather the fruit.

SELECTION OF TREES.

Strong, well-rooted, 1-year-old trees are preferable to any other age, whether standard or dwarf.

As to the selection of standard or dwarf trees, every planter will be governed by the object to be attained. If early fruitfulness is desired, dwarfs are preferable; but it should be borne in mind that such trees are usually shorter lived and seldom attain large size. For these reasons they are better adapted to small lots or to garden purposes. Some varieties, such, for instance, as Anjou, Angouleme, Diel, Louise, etc., do better on the quince root than on the pear stock.

On the other hand, if longevity of tree, larger size, and capacity for producing heavier crops are desired, standards should be planted. It is well also to consider the character of the soil in the location selected as to adaptability of class desired, as explained under "Soils."

VARIETIES TO PLANT.

Pears vary in their season of ripening, so that if proper attention is given to the selection of varieties and to careful handling and

storing, the pear grower may have fruit for his table or market from midsummer until March. Many varieties which are inferior in size, unattractive in appearance, or so tender in texture as to be disqualified for commercial purposes, yet possess qualities that render them of value to the amateur planter. The varieties in the following list are some of the most desirable, arranged approximately in the order of ripening:

Amateur list.—Bloodgood, Clapp Favorite, Giffard, Bartlett, Ros-tiezer, Brandywine, Tyson, Flemish Beauty, Lucrative, Bosc, Winter Nelis, Louise, White Doyenne, Seckel, Sheldon, Anjou, Kieffer, Angouleme, Comice, Danas Hovey, Lawrence, Easter Beurre.

Commercial list.—Varieties of attractive appearance, medium size, productiveness, and vigor of tree are of prime importance in planting a commercial pear orchard. The following are recommended: Tyson, Clapp Favorite, Bartlett, Bosc, Louise, Winter Nelis, Sheldon, Anjou, Kieffer, Comice, Lawrence, Easter Beurre. For the Central and Southern States: Le Conte, Kieffer, Garber.

Dwarfs.—Certain varieties of the pear do better on the quince stock than on the pear. Such varieties are as follows: Angouleme, Louise, Diel, Anjou, Clairgeau, Lawrence.

Many other varieties may be grown with fair success on the quince root, such as Bartlett, Bosc, Columbia, and White Doyenne.

FERTILIZATION.

Some varieties of pear are infertile by themselves and therefore varieties should be intermingled in planting in order to insure fruitfulness. No more than two rows of one variety should be planted together, alternating with some other variety that is considered a good pollinizer. The Anjou, Bartlett, Clapp, Kieffer, Lawrence, Louise, Sheldon, and Winter Nelis varieties are considered more or less self-sterile; the Angouleme, Bosc, Flemish, Seckel, Tyson, and White Doyenne varieties are generally self-fertile. It may be said, however, that self-fertile varieties under some conditions may become self-sterile under other conditions.

WHERE TO OBTAIN TREES.

It is always advisable to purchase trees from the nearest responsible home nurseryman whenever possible, thereby lessening the cost of transportation and the liability to damage by long transit and frost. Local nurserymen are more likely to be interested in filling orders with varieties true to name than the traveling salesmen, from whom redress is seldom possible in case the order is not filled properly.

CULTIVATION.

Thorough and frequent stirring of the ground between the rows with a cultivator should be done during the early part of the growing season or from early spring until July 1, when cultivation should cease so that the new growth of wood may harden up sufficiently to endure the winter temperature. This is especially essential in the Middle and Northern States, where a low temperature often occurs.

After the spring plowing the cultivation may best be done by using some kind of cultivator or harrow as often as it is necessary to keep the ground well pulverized.

After the trees have attained sufficient size and age to commence fruiting, cultivation may be discontinued for a while and the land seeded to clover. This cover crop will check the rapid growth of the trees and bring the trees into bearing sooner than if cultivation is continued. If the clover is allowed to fall on the ground instead of cutting and removing it, it will act as a mulch and serve to retain moisture in summer and be a protection in winter.

If desirable to grow other crops between the rows of trees as a matter of economy this may be done for a few years after being set out without any detriment to the orchard, provided the crop is of such a nature as to require thorough cultivation. To grow among the trees the first season after planting there is no better crop than corn. It requires thorough cultivation and affords a shade to the newly planted tree at the season when it most needs protection from the sun's greatest heat. Other crops, such as potatoes, cabbage, peas, beans, melons, etc., may be grown to advantage. Small grain or grasses which do not require cultivation should not be allowed in the newly planted orchard. All these crops take from the soil plant food which will be needed in time for the orchard's support and which should be returned in some form of manure.

COVER CROPS.

Cover crops, by conserving moisture and adding elements of fertility to the soil, are beneficial to the pear orchard. Among the desirable cover-crop plants are the clovers and legumes, such as cowpeas, beans, vetches, etc. These cover crops not only protect the roots of the trees from extreme cold and prevent the washing of land by fall and spring rains, but they afford that supply of humus so essential for the maintenance of the fertility of the soil and its physical condition. To obtain best results, cover crops should be left on the ground over winter and turned under in early spring by shallow plowing, so as not to disturb the roots of the trees. The kind of cover crop to be grown will have to be determined by climatic

and soil conditions. Wherever crimson clover can be grown it is one of the best plants for a cover crop, but it fails to give general satisfaction in some of the Northern States. Among other plants sometimes used and of more or less value as cover crops are oats, rye, barley, and millet.

If the practice of sowing cover crops and turning them under is continued from year to year, the land will gradually be enriched and the soil maintained in proper physical condition.

PRUNING AND TRAINING.

OBJECTS TO BE ATTAINED.

Pruning and training are important requisites in the successful management of a pear orchard. The objects to be attained are: (1) Symmetrical, evenly balanced heads; (2) the admission of sunlight and free circulation of air into all parts of the tree tops; and (3) the maintenance of sufficient foliage to protect



FIG. 3.—One-year-old pear tree. The line shows where to cut back at time of pruning.

the trunks and branches from the intense heat of the sun's rays which would otherwise be likely to scald and injure both tree and fruit.

Pruning should begin as soon as the trees have been planted by cutting back the young tree at the time of planting to the height from the ground it is proposed to start the branches to form the head of the tree, which should not be over 12 to 15 inches, as shown in figure 3. This cutting back will cause several of the upper buds to break and grow, thus starting the top or head at the proper height. The starting branches should be watched and only such left to grow as are to form the main branches. The strongest shoots should be left at equal distances apart around the stem and should tend obliquely

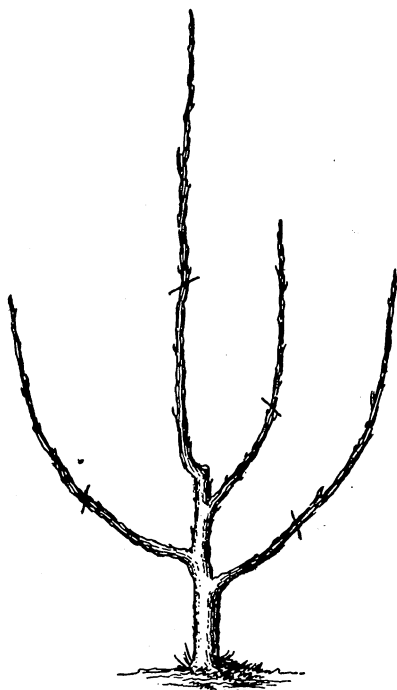


FIG. 4.—Two-year-old pear tree. The lines show where to cut back at time of pruning.

outward so as to spread and make an open head. The second year these shoots should be shortened back to the extent of about half of the growth, as shown in figure 4. The same plan should be continued the third and fourth years.

In all pruning, to give the desired form to the head and especially while the tree is young, the orchardist should keep clearly fixed in his mind the form of the tree as it is to be when old; for what may seem to be an open head when the tree is young may prove to be too dense and crowded when the tree is older. The branches should not be too close together for convenience in gathering the fruit.

During late winter or in early spring before the sap starts, each tree should be carefully looked over and all branches which are likely to interfere with adjoining ones should be cut out and the centers of dense growth thinned out; side branches which are making a stronger growth than the others should be checked by shortening in, so as to maintain an evenly balanced head. Some varieties have an upright habit of growth and some make a slender, straggling growth. All need attention each year. In cutting back the last year's growth the top bud should be left on the side of the branch facing the direction in which the growth needs to be diverted. By this method there will be no difficulty in shaping the tree into any desired form.

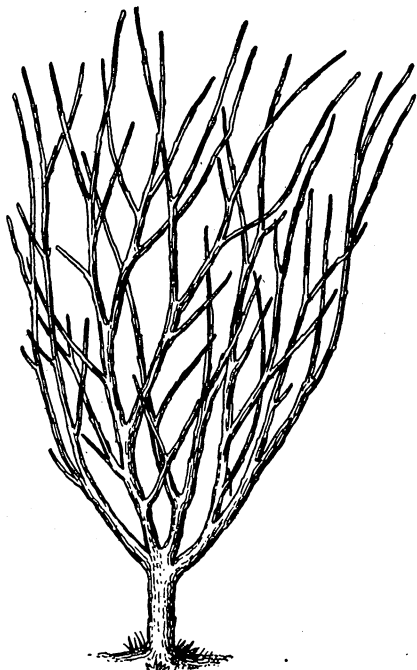


FIG. 5.—Vase or goblet form of top.

All pruning and training possible should be done while the trees are young and the growth of wood is tender. At such time the healing over is more rapid and complete, and the tree suffers less injury.

Old trees that have been neglected may be renewed by severe pruning, cutting back all the branches that are not in a healthy condition. This pruning will cause new, vigorous shoots to grow. The new growth will need to be cut back as occasion requires. By persistent pruning an entire new top may be formed in a few years.

When the removal of a large branch is necessary, the wound should be covered with grafting wax, paint, or some other substance that will prevent evaporation and keep the wood from checking and consequent decay.

FORM OF TOP.

In foreign countries the pear is trained into many forms by pruning, but in this country the forms followed in shaping the tree are mainly limited to three—vase, pyramidal, and intermediate.

Vase or goblet form.—The vase or goblet form, or some modification of it, prevails to a large extent in the Pacific coast region, where by long experience it has been found to be best suited to the conditions of that section of country. It is particularly suited to sections where blight is troublesome because of the ease with which the infected branches can ordinarily be cut out before the disease reaches the trunk

of the tree. Growth into this form is promoted by cutting back the 1-year-old tree after it is transplanted from nursery to orchard to 12 to 15 inches from the ground, all limbs having been removed, leaving but a single stalk, as shown in figure 3. After the buds begin to grow, all but three or four should be rubbed off, leaving those that are intended for the top evenly distributed on all sides of the tree and several inches apart vertically. Subsequent pruning must be done each year by

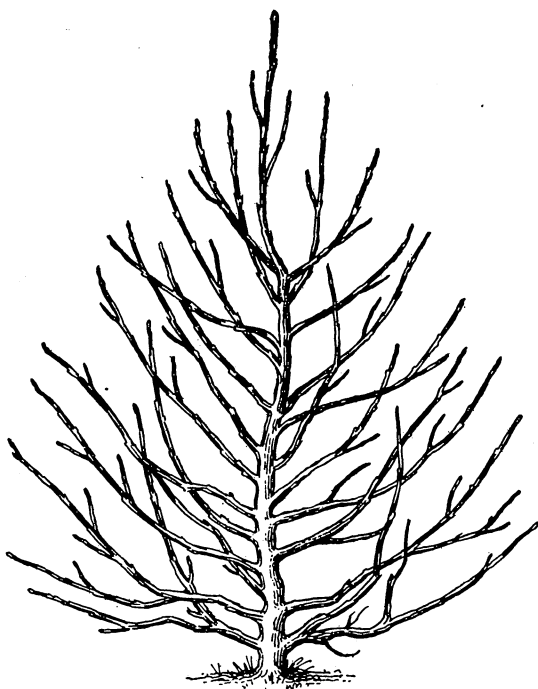


FIG. 6.—Pyramidal form of top.

shortening back the new growth and thinning out with a view to shaping the tree, as shown in figure 5.

Three or four main branches that were allowed to grow should be continued upward to form the framework of the tree, and all the pruning and training should be done with a view to forming an open head to admit sunlight and air to all branches of the tree. Shortening back of the annual growth is very essential, especially on dwarfs.

Pyramidal form.—The pyramidal form differs from the vase form in that the main leading shoot of the tree is allowed to maintain its upright growth and the side branches are shortened back so as to produce the shape of a pyramid, as shown in figure 6.

As in pruning for the vase form, the main stock of the 1-year-old tree should be cut back to 12 to 15 inches, but numerous branches are allowed to grow in order that the tree may assume the form shown in the figure.

Intermediate or natural form.—The intermediate form (fig. 7) is probably the best for training the pear. It is a compromise between the vase and the pyramidal forms and its outlines are not so conventional. The tree is allowed to grow more in accord with its natural habit, but it must be checked more or less in its growth so as to conform to the ideas of the planter. Different varieties of the pear vary greatly in their habits of growth. Some trees are upright and some are of a drooping habit. Both of these forms should be modified. Upright branches are shortened back and induced to spread out; and the limbs of the tree inclined to droop are encouraged to grow more nearly upright.

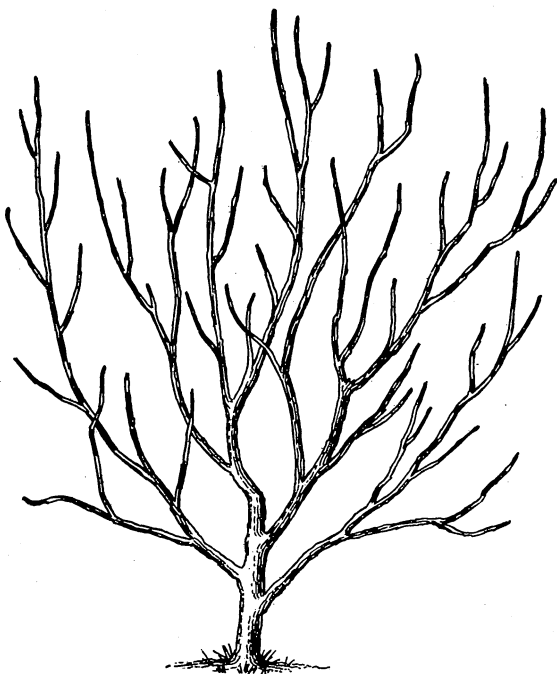


FIG. 7.—Intermediate or natural form of top.

HEIGHT OF TOP.

It is now conceded that low-topped trees are preferable to the old high-topped system of training, which was to train trees to 4 or 5 feet in height.

The objection to low-headed trees on account of the difficulty of cultivating the land has been overcome by practical experience. A careful teamster will do less damage to a low-headed tree than to one with a high top; with the improved implements now in use thorough tillage can be performed as well among low-headed trees as with higher ones. There is less danger from high winds with low heads; pruning and spraying can be performed with greater facility and the expense of gathering the fruit is greatly reduced. Another important advantage gained by low heads is the protection of the body of the tree from the hot sun causing what is known as sun scald, which is prevalent in some sections of the country.

PROTECTION FROM RODENTS.

Wherever mice and rabbits exist they are liable to do much damage to young fruit trees during the winter months, especially when the ground is covered with snow. Anything that affords protection to mice, such as grass, weeds, or leaves should be removed from around the trunks of the trees, leaving the ground bare. Mice will not work in such exposed places.

It is only when the natural food of the rabbit is cut off by being covered with snow that this destructive little animal is forced to resort to other means of subsistence by gnawing the bark of fruit trees. To prevent this pest from doing this damage many methods have been devised. Washes of various kinds have been used, but the most effective plan is to tie some material to the height of 2 feet or more around the body of the tree. Cornstalks cut to the desired length are the most available material for the farmer to use and serve the purpose very well. Building paper is very effective, and even old newspapers tied around the trees have been found to do good service while they last. All things considered, wire netting is perhaps the best and most effective material. Its first cost is somewhat greater, but in the long run it is cheaper. It is light and open, admitting air and sunlight freely, and affords no harbor for mice or insects. This netting or wire cloth is made of galvanized wire No. 22, $\frac{1}{4}$ -inch mesh. It is made 24 to 36 inches in width and can be purchased at any hardware store at about \$3 per roll of 100 linear feet for the 24-inch width. A 12-inch strip cut from this roll is sufficient to encircle a tree, thus making the cost of protection about 3 cents each.

DISEASES AND INSECT ENEMIES.¹

PEAR BLIGHT.

Pear blight, also known as fire blight, is the most destructive and the most difficult to control of all diseases with which the pear is affected. All attempts to check its ravages by the ordinary methods of spraying with the different compounds have been of no avail. The conditions that are most favorable to the development of the

¹ For additional information relating to diseases and insect enemies of the pear the reader is referred to the following publications of the Department of Agriculture:

Cold Storage with Special Reference to the Pear and Peach. Bulletin 40, Bureau of Plant Industry. 1903.

Nomenclature of the Pear; a Catalogue-Index of the Known Varieties Referred to in American Publications from 1804 to 1907. Bulletin 126, Bureau of Plant Industry. 1908.

The Cause and Prevention of Pear Blight. Yearbook, U. S. Dept. of Agriculture, for 1895, pp. 295-300.

Commercial Pear Culture. Yearbook, U. S. Dept. of Agriculture for 1900, pp. 369-396.

disease are a moist, warm atmosphere when the tree is making its most rapid growth, generally in the month of June. In dry seasons when the trees make a slow, scanty growth blight seldom makes its appearance; hence the importance of avoiding too much nitrogenous manure which would stimulate the tree into a rapid succulent growth.

In some sections of the country, as in the Middle West with its rich prairie soil, pear blight is much more prevalent than in the sections where the soil is not so rich in humus and the trees make a slower growth.

In some parts of this country, notably in New England, this disease is much less destructive than in other sections. Some varieties are less subject to attack; for example, Seckel, Kieffer, Garber, Le Conte, Angouleme, etc. No remedy has yet been discovered, but there are treatments that in a measure modify and mitigate the severity of the disease, and, as before stated, the checking of too rapid growth is one means of prevention, and by the proper use of the knife and saw the disease can be quarantined and its spread held in check. As soon as any blight appears on the young growth it should be severely cut back and the branches burned. Throughout the growing season the trees should be watched with the utmost vigilance and all signs of blight as they appear should be entirely removed. Symptoms of the disease can more readily be detected while the leaves are on the tree by observing their discoloration. The work of inspection, however, should not cease with the falling of the leaves. The search must continue through the winter to discover any trace of the disease that may have escaped notice of the observer during the growing season.

PEAR SCAB.

A fungus disease similar to if not the same as apple scab is easily controlled by spraying with Bordeaux mixture or the lime-sulphur preparation.

INSECTS.

The pear in common with other fruits is subject to the depredations of insects, among the more important of which are the codling moth and the San Jose scale.

The larva of the codling moth, which affects the apple to such an alarming extent, entailing a loss of millions of dollars, is also more or less injurious to the pear, though to a much less extent than to the apple.

Probably no other insect, if uncontrolled, is capable of doing greater damage to the fruit industry of this country than the San Jose scale. Nearly all kinds of deciduous fruit trees are more or less subject to its attacks. It multiplies and spreads with such great

rapidity that unless controlled it is but a question of a short time until the tree is ruined and death follows. Nevertheless, this insect can be controlled at comparatively small cost, so that it is no longer to be regarded as an insurmountable obstacle to the growing of fruits. Experiments have been carried on by the entomologists of several State experiment stations and the United States Department of Agriculture with satisfactory results. The use of the lime-sulphur wash has come to be the generally accepted remedy.

For full information on the San Jose scale and its control, readers should apply to the Secretary of Agriculture, Washington, D. C., for Circular 124 of the Bureau of Entomology. The control of the codling moth on pears is fully treated in Bulletin 97, Part II, of the same Bureau.

THINNING THE FRUIT.

In order to produce a high grade of fruit it becomes necessary to thin the overloaded trees by taking off all deformed inferior fruit, insect-infested specimens, as well as the perfect fruits wherever they are nearer than 4 to 6 inches on the limb; this thinning is done at the proper time, customarily after what is known as the June drop. By this thinning the remaining fruit grows larger and at gathering time it will be found that the quantity in bulk has not been reduced, but in fact there will be more bushels of fruit of first grade on the tree than if all the fruit had remained. The fruit will be increased in size and quality and the tree will be relieved of a corresponding burden and consequently be better able to bear a crop of fruit the following year.

The proper time for thinning depends somewhat upon the season, usually about the last of June or early in July. The amount of fruit to be removed will depend largely upon the judgment of the grower and the quantity of fruit set. The cost of thinning will scarcely be any more than the extra work occasioned by the picking and grading of so much inferior fruit when the whole crop is allowed to grow without thinning.

GATHERING THE FRUIT.

A knowledge as to the best time for gathering pears can be most readily obtained from careful observation and experience. No precise and invariable rule can be given. Some growers gather the fruit as soon as the seeds turn brown. While this condition may be safe in a general way, and even necessary for shipping to a distant market, it does not afford the highest excellence of fruit for dessert purposes. Some varieties, such as Clapp Favorite, require picking some time before they are fully ripe in order to prevent rotting at the core. This rule applies more or less to most of the early varieties.

As a general rule it is safe to gather the fruit whenever the stem will easily part from the limb by twisting or turning the fruit from the natural position with thumb and forefinger.

All fruit should be gathered with the stems unbroken, carefully avoiding bruising or breaking the skin.

As pears of any one variety do not all ripen at the same time several pickings at intervals will be necessary. This is no disadvantage to the grower, as it will aid him in disposing of the crop without loss.

Winter sorts should be left on the tree as late in autumn as it is safe to leave them without freezing.



FIG. 8.—Bartlett pear orchard, showing manner of picking the fruit by the use of ladders.

Some form of ladder is absolutely essential in gathering pears, especially for standard trees after they have attained a considerable size. Nearly all of the fruit on dwarf trees can be picked from the ground if the trees have been properly pruned. A three-legged step-ladder with a wide spread of legs at the bottom is probably the most serviceable form, all things considered. Its three legs afford easy adjustment to uneven ground. (See fig. 8, right-hand corner.)

A splint half-bushel basket, cloth lined and with adjustable bale, is best for gathering the fruit.

SORTING AND GRADING THE FRUIT.

A crop of fruit of any kind will bring the grower more money when properly sorted and sold by grades as firsts, seconds, and culls. The

first grade should consist of such as are of average uniform size, well formed, clean in appearance, sound, and free from blemish and insect injuries. Seconds are the same as first grade with the exception of being smaller in size and irregular in form.

Culls, or the third grade, may include all that are rejected from the first and second grades, except those suitable for canning, preserving, or evaporating.

PACKAGES.

The packages used for marketing pears vary according to the section of country where the fruit is grown. In California boxes each having a capacity of about 40 pounds are universally used. The inside measurements of these boxes are as follows: Length, $18\frac{1}{2}$ inches; width, $11\frac{3}{4}$ inches; depth, $8\frac{1}{2}$ inches. In New England and New York State a keg holding about 1 bushel is largely used. In New York and Michigan a special pear barrel, having a capacity 1 peck less than the standard apple barrel, is largely used. In the States where the Kieffer and Le Conte are largely grown the common apple barrel is used. The half-bushel box, neatly made, is better adapted for the choice varieties of pears. A box of this size or even smaller is better suited for the retail trade than a larger one. Fancy fruit wrapped in paper and with fancy labels on the package will command fancy prices, according to the old saying, "the best articles are always put up in small packages." For convenience in handling and shipping, these packages can be crated at very slight expense and they reach a home or foreign market in perfect safety. It pays the grower handsomely to carefully pick, grade, and pack his fruit in the very best manner possible. A few cents paid in ornamenting and branding packages is money well spent.

THE FRUIT ROOM.

An apartment especially adapted for use as a fruit room is needed on every farm where fruit is grown even in such quantity as to be used for family purposes only. It should be so constructed as to afford protection from heat in summer and from frost in winter and sufficiently ventilated to maintain purity of air and freedom from odors.

Shallow bins not more than 4 inches deep may be constructed along its walls, one above another and far enough apart to afford ample space for placing the fruit and for its subsequent handling.

Strict cleanliness should be maintained in every detail of handling. Care in this respect is essential to the preservation of the delicate aroma that characterizes many kinds of the pear and to the retention of the exquisite flavor so much desired. In no case should vegetables of any kind be stored in the same room with the fruit.

DISPOSING OF THE CROP.

If for home use or home market, the fruit as soon as picked should be carried to the fruit room, carefully sorted and graded, and placed not more than two or three layers deep in bins. While undergoing the sweating process in the bins the fruit should be covered with paper to exclude air and light and should be examined often for the change from the hard, green condition to the yellow, mellow state. Fruit showing this change should be sorted out for use or for market. If to be sent to market it should be carefully packed in small, paper-lined baskets or shallow boxes and shipped at once.

Each package should be branded with the name of the variety and the name of the grower. Choice fruit in small packages finds ready sale at high prices for immediate family use.

Winter varieties are stored in the fruit room in the manner described and keep well if held at as low a temperature as possible without freezing. When desired for use or market during the winter months the pears may be brought into a moderately warm room to mellow or ripen. The fruit must be protected from light and air or it will become wilted and tough and would also lose its excellent flavor.

The practice of wrapping each fruit in paper after the method adopted with the lemon and orange as soon as picked and sorted affords better results with most classes of fruit for shipment.

ABRIDGED DESCRIPTIONS OF SELECT VARIETIES OF PEARS.

The main object of the brief descriptions that follow is to direct the attention of the prospective grower to some of the most desirable varieties of pears which in the experience of the writer have proved to be the most valuable for commercial and family use and, also, to give some idea of the quality of the fruit to serve as a guide in the selection of varieties for planting. The time of ripening of varieties depends upon the latitude, elevation, and local conditions where they are grown; therefore, dates can only be given approximately. The name of each variety herein used is the one adopted by the American Pomological Society, which is the recognized authority on nomenclature. Synonyms when given are shown in parentheses:

BLOODGOOD.

Origin, Long Island. Medium size, turbinate, inclining to obovate (fig. 9); skin yellow, with russet dots and network markings; calyx strong, open, set almost without depression; stalk obliquely inserted



FIG. 9.—Bloodgood pear.

without depression, short, fleshy at base. Flesh yellowish white, buttery, melting, with a rich, sugary, aromatic flavor; very good. Ripens in midsummer; like most early pears it is better if picked early and ripened indoors. A most delicious pear, deserving a place in every fruit garden, but not attractive for market.



FIG. 10.—Clapp Favorite pear.

marbled and splashed with crimson on exposed side, thickly sprinkled with brown dots; stalk an inch long, a little inclined, stout, somewhat fleshy; calyx partly closed. Flesh white, fine grained, juicy, melting, buttery, rich, sweet, vinous, slightly perfumed. Ripens about 10 days before Bartlett. Tree upright, spreading; very productive. Should be picked before fully ripe.

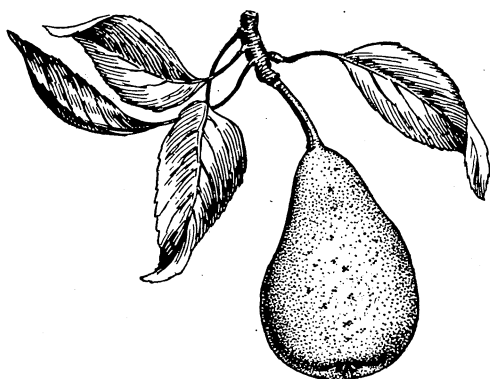


FIG. 11.—Giffard pear.

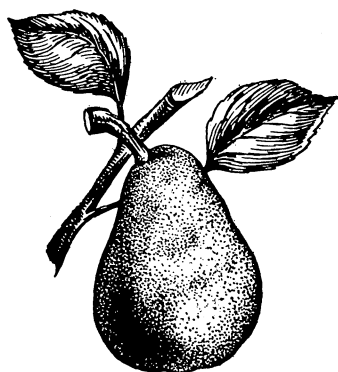


FIG. 12.—Bartlett pear.

BARTLETT.

Origin, England. Large, obtuse pyriform; surface uneven (fig. 12); skin thin, bright clear yellow, with blush on the sunny side on exposed specimens, sometimes a little russet. Flesh white, buttery, juicy, highly perfumed, vinous flavor. Ripens in midsummer. It is one of the few choice varieties that suc-

GIFFARD.

Origin, France. Fruit medium size, pyriform, tapering to the stem, which is rather long (fig. 11); skin greenish yellow, marbled with red on exposed side; calyx closed. Flesh white, melting, juicy, vinous flavor; very good. Ripens in August. Should be gathered before fully ripe.



FIG. 13.—Rostiezer pear.

ceed over a wide range of country and is more largely grown for commercial purposes than any other variety. Excellent for canning, preserving, and evaporating.

ROSTIEZER.

Origin, Germany. Medium size, oblong pyriform (fig. 13); color dull yellowish, mixed with reddish brown; stem long, slender, curved, inserted with slight depression; calyx open, persistent; basin small and corrugated. Flesh juicy, slightly buttery, melting, sugary, vinous, aromatic, perfumed; quality best of its season, August and September. Tree an early and profuse bearer.



FIG. 15.—Tyson pear.

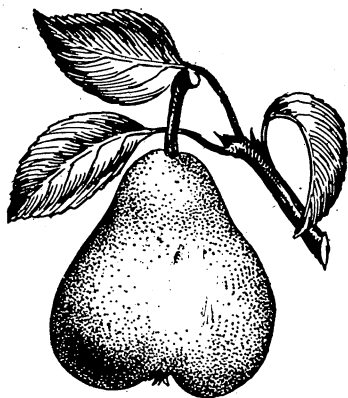


FIG. 14.—Brandywine pear.

BRANDYWINE.

Origin, Pennsylvania. Size medium, pyriform (fig. 14); skin dull yellowish green, slightly russeted, with a warm cheek on sunny side; stalk fleshy at its junction with the fruit; calyx open. Flesh white, juicy, melting, sugary, vinous, aromatic; late summer.

TYSON.

Origin, Pennsylvania. Medium or below in size; conic pyriform (fig. 15); skin clear deep yellow, with a fine crimson cheek and numerous brown dots; stem long and curved, inserted with a fleshy ring or lip; calyx closed. Flesh juicy, very sweet, melting, aromatic; late summer. Tree vigorous, upright grower, very productive. An excellent variety both in tree and fruit.

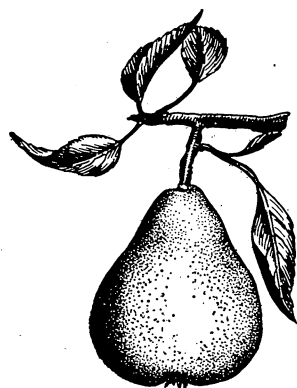


FIG. 17.—Lucrative pear.

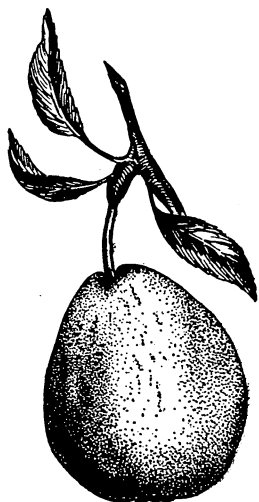


FIG. 16.—Flemish pear.

FLEMISH (FLEMISH BEAUTY).

Origin, Belgium. Fruit large, obovate, obtuse pyriform (fig. 16); surface yellow, covered with patches of light russet, becoming reddish brown on the sunny side; stalk 1 to 1½ inches long; calyx shore, open. Flesh yellowish white, juicy, melting, sweet, rich, with a slightly musky flavor; very good; September.

LUCRATIVE (BELLE LUCRATIVE).

Flemish origin. Medium size; variable in form from globular to obtuse pyriform (fig. 17); stalk $1\frac{1}{4}$ inches long, often fleshy, oblique; cavity small and narrow; calyx short, open. Flesh juicy, melting, rich, sugary, delicious; last of September.



FIG. 18.—Bosc pear.

BOSC.

Origin, Belgium. Large, decidedly pyriform; neck long, tapering to the stem, which is 1 to 2 inches long and rather slender (fig. 18); color dark yellow, covered with dull cinnamon russet with dots or streaks, sometimes with a tinge of red. Flesh white, very buttery, melting, rich, perfumed. Tree vigorous, a regular bearer; fruit evenly distributed over the tree and always of good size. A valuable market variety; midautumn.

LOUISE (LOUISE BONNE DE JERSEY).

Origin, France. Fruit large, oblong pyriform (fig. 19); greenish yellow, overspread with brownish red, becoming brighter on the sunny

side; stalk long, often fleshy at insertion; calyx open. Flesh yellowish white, very juicy, buttery, melting, rich, slightly subacid; good to very good; midautumn. Tree very productive; excellent on quince stock.

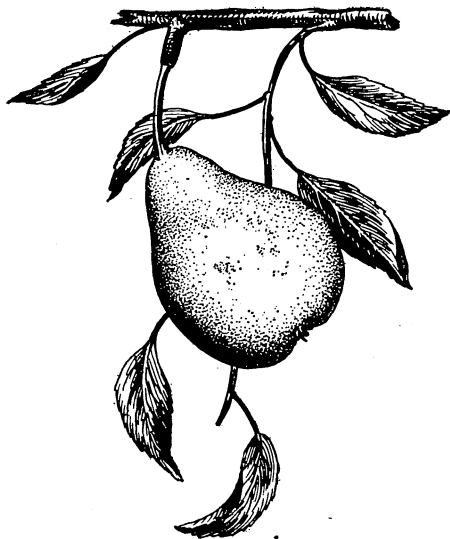


FIG. 19.—Louise pear.

WHITE DOYENNE.

Origin, France. Medium to large, obovate, obtuse (fig. 20); surface pale yellow, often a faint blush;

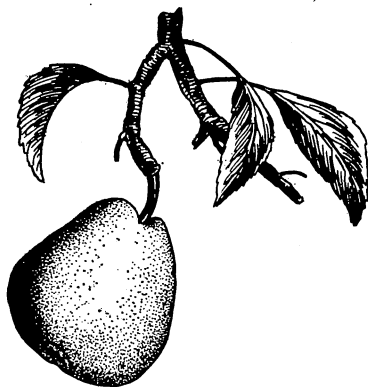


FIG. 20.—White Doyenne pear.

stalk 1 inch long; calyx small, basin shallow. Flesh fine grained, melting, buttery, high flavored, delicious. Better adapted to the rich soils of the West. Last of September; if picked before fully ripe, will keep until December. In some sections it is subject to cracking and scab.

SECKEL.

Origin, Pennsylvania. Fruit small, roundish, obovate (fig. 21); surface yellowish brown, with a lively russet-red cheek; stalk one-half to three-fourths

of an inch long; calyx small, in a basin scarcely sunken. Flesh fine grained, sweet, very juicy, melting, buttery; considered to be the acme of perfection among pears. End of August to last of October.

SHELDON.

Origin, New York. Medium or large, roundish, obtuse obovate (fig. 22); skin greenish yellow, covered with thin russet, a little brownish crimson with russet dots on exposed side; stalk short, stout; cavity deep; calyx open. Flesh whitish, sweet, very juicy, melting, vinous, texture rather coarse; very good;

October.
Tree vigorous; it requires double working on quince.

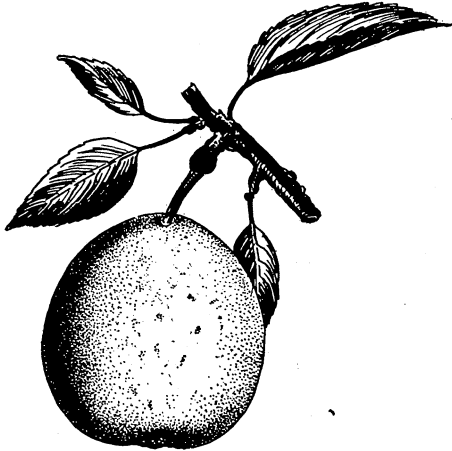


FIG. 22.—Sheldon pear.

vigorous, open round head; fruit evenly distributed and of uniform size. An excellent market variety.

KIEFFER.

Origin, Pennsylvania. Medium to large, oval pyriform (fig. 24); rich golden yellow sprinkled with numerous dots, sometimes beautifully shaded with red on sunny side. Flesh rather coarse, juicy, varying from good to poor in quality; valuable for canning and preserving; October to December. Tree vigorous and very productive. Adapted to a wide range of country.

ANGOULEME (DUCHESS D'ANGOULEME).

Origin, France. Large to very large, oblong obovate (fig. 25); surface uneven; dull greenish yellow, with more or less of russet spots; stalk 1 to 1½ inches long, stout; cavity deep, often wide; calyx small, basin uneven. Flesh white, melting, buttery, juicy; quality excellent when well grown; best on

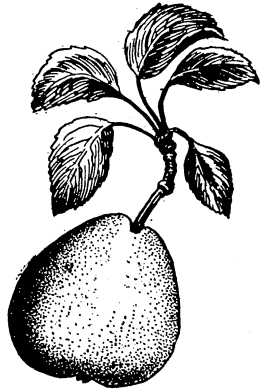


FIG. 21.—Seckel pear.

ANJOU.

Origin, France. Large, obtuse pyriform; stem short, thick, fleshy (fig. 23); skin greenish yellow, sometimes shaded with dull crimson and sprinkled thickly with brown dots; calyx very small, open, stiff, in a small basin surrounded with russet. Flesh whitish, melting, juicy, brisk, vinous; late autumn to early winter. Tree

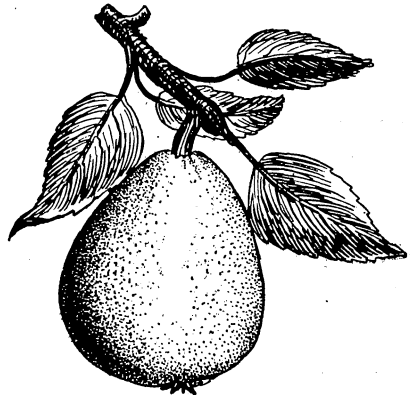


FIG. 23.—Anjou pear.

quince stock. Ripens in midautumn. Tree a vigorous grower, very prolific, and profitable; a very popular variety for commercial purposes.

COMICE.

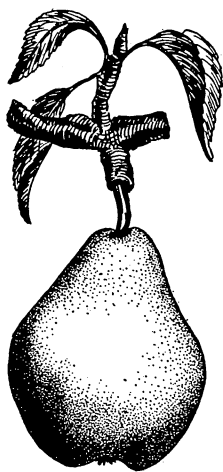


FIG. 24.—Kieffer pear.

Origin, France. Fruit large, varying from roundish to obtuse pyriform (fig. 26); greenish yellow, clear yellow at maturity, some russet shaded with crimson on sunny side; stalk short and stout, inclined and set in a shallow cavity; calyx small, open, in a deep, uneven basin. Flesh white, fine grained, sweet, rich, slightly aromatic flavor; October and November.

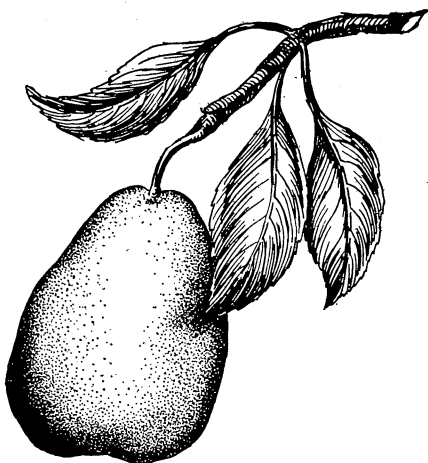


FIG. 25.—Angouleme pear.

DANAS HOVEY.

Origin, Massachusetts. Rather small, obovate, obtuse pyriform (fig. 27); pale yellow, with patches of cinnamon russet and sprinkled with brown dots; stalk rather short, slightly curved, set in a shallow cavity; calyx open, basin small, uneven, slightly russeted. Flesh yellowish, juicy, rich, sugary, aromatic; one of the most delicious pears grown; early winter.



FIG. 26.—Comice pear.

juicy, buttery, sweet, aromatic; very good to best; December.

LAWRENCE.

Origin, Long Island. Fruit medium or above in size, obovate, obtuse pyriform (fig. 28). somewhat uneven; color lemon yellow, with traces of russet and numerous brown dots; stalk of medium length, rather stout, set in an irregular russeted cavity; calyx open, basin broad, shallow, uneven, and thinly russeted. Flesh whitish,

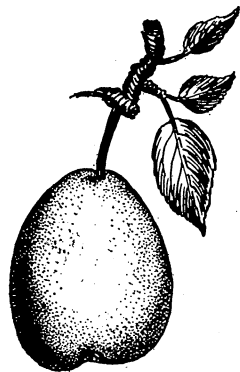


FIG. 27.—Danas Hovey pear.

WINTER NELIS.

Flemish origin. Fruit medium, roundish obovate, somewhat pyriform (fig. 29); stalk $1\frac{1}{2}$ inches long; calyx open, basin shallow, ribbed. Flesh yellowish, fine grained buttery, melting, sweet, rich, aromatic flavor. Early winter; one of the best of its season.

EASTER BEURRE.

Origin, France. Fruit large, roundish obovate, obtuse (fig. 30); stalk rather short, stout, in an abruptly sunken cavity; calyx small, closed, slightly sunken; skin yellowish green, with many russet dots and reddish-brown cheek. Flesh white, fine grained, buttery, rich, sweet, and juicy; January to March. Does not mature if planted too far north.

SUMMARY.

(1) A gentle eastern or northeastern slope as a rule is preferable for an orchard site, but this feature may vary according to conditions.

(2) Soils such as are found in timbered regions are best suited for the pear. Stimulating fertilizers are conducive to pear blight; care should be taken to guard against the disease.

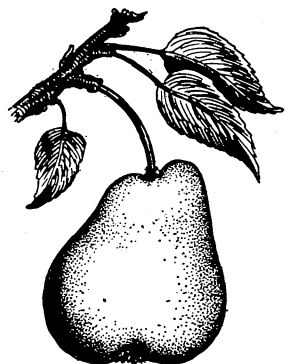


FIG. 29.—Winter Nellis pear.

(3) One-year-old trees with well-developed root systems are considered best, and at the time of planting they should be cut back to the height at which the main branches for the future top are to be formed. All broken and bruised roots should be cut back to sound tissue. For easy planting, open a deep furrow with a 2-horse plow along the line where the rows are to be made and cross-check at the distance apart at which the trees are to stand.

At the crosses level off the bottom of the furrow to receive the tree with its roots in their natural position; fill in among the roots and trample down the soil, leaning the tree slightly to the southwest.

(4) Prune each year while the tree is in a dormant state; remove interfering cross branches and thin out where too densely grown; balance the top so as to afford free air circulation and admit sunlight to all parts of the tree.

(5) Picking, sorting, and packing the fruit should be done carefully so as to avoid bruising or puncturing the skin.

(6) Summer and autumn varieties, if for market, unless placed in cold storage where they may be held for a while during a glut in the market, require immediate attention and disposition.



FIG. 28.—Lawrence pear.

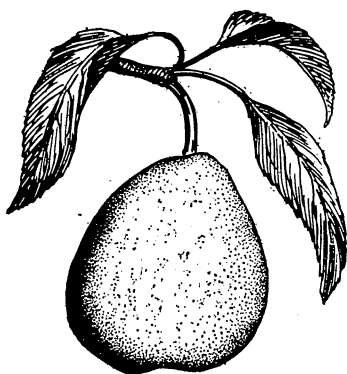


FIG. 30.—Easter Beurre pear.